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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ALANKO, ANITA KAREN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 03/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/633,241

Applicant(s)

BATTAL ET AL.

Examiner

Anita K. Alanko

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 2/17/06 RCE.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/17/06 has been entered.

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the specifications lacks explicit basis for the amended claim language “correspond to said area relative to another area of said semiconductor wafer” as in claim 1 or “corresponding to said at least one of said different areas relative to another of said different areas” as in claim 13.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-7, 9-10, 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amartur (US 6,664,557 B1).

Amartur discloses a method comprising:

providing light ("broad band light source", col.7, lines 2-7) on an area of a surface of a semiconductor wafer 300 (Fig.2B);

receiving light reflected from said area of said surface (Fig.4, step 402, receiving reflectance data);

analyzing a reflectance spectra (Fig.4, steps 404-422) associated with a location of the area from which the measurement was obtained (the locations are inherent since light is directed to a surface that has an area);

repeating said steps listed hereinabove (if in step 422 the sum is not greater than a threshold) until an intermediate reflectance spectra is identified that has a sinusoidal shape when normalized (normalized in step 404, sinusoidal when curve changes from 502 to 504 in Figure 5); and

adjusting a parameter of the CMP process based on the analysis of said reflectance spectra and said location associated therewith (the endpoint, the process is adjusted by stopping

the process). As to amended claim 1, the adjustment, as broadly interpreted, corresponds to the surface being polished relative to another area of said semiconductor wafer (not being polished, the backside).

Amartur fails to disclose whether the light source is continuous or pulsed. Examiner takes official notice that continuous and pulsed light sources are conventional in optical monitoring methods. It would have been obvious to one with ordinary skill in the art to use a pulsed light source in the method of Amartur because they are conventional sources of light.

As to amended claims 1 and 18, Amartur fails to explicitly disclose tracking. However, as broadly cited, the method encompasses tracking since the light is not arbitrarily directed, but rather is directed to a specific location where monitoring is desired, i.e, a specific location is tracked. The area is large, in the example of overburden copper in Figure 3, but this nonetheless encompasses tracking an area.

As to claim 2, since Amartur has the same method as in the instant invention, it is expected to encompass having changing spectra when a different material is exposed (see Figure 3).

As to claim 3, Amartur teaches that overpolishing is conventional in order to ensure that all conductive material is removed (col.3, lines 35-37). It would have been obvious to one with ordinary skill in the art to overpolish for a predetermined time period to ensure said layer of material is removed because Amartur teaches that this is useful during CMP of conductive material.

As to claim 4, examiner takes official notice that overpolishing and then stopping after a predetermined time period is conventional in the art. It would have been obvious to one with ordinary skill in the art to do so in the method of Amartur because it is conventional in the art.

As to claim 5, Amartur discloses to use a broad band spectrum of light and to analyze the reflected light over a plurality of wavelengths (col.7, lines 2-7).

As to claim 6, Amartur does not disclose the cited wavelength, however examiner takes official notice that it is conventional in the art. It would have been obvious to one with ordinary skill in the art to use the cited wavelength range in the method of Amartur because it is conventional in the art.

As to claim 7, Amartur discloses to use fast fourier transform analysis (step 416).

As to claim 9, it would have been obvious to use the cited pulse length since it is conventional for optical monitoring techniques in order to optimize the process for best results.

As to claim 10, it is expected that the spot size is as cited in Amartur since the same method with the same results are obtained as in the instant invention.

As to claim 18, see the rejections above. Amartur teaches to form a trench in a dielectric layer 102 (Fig.1A) with a barrier material 104, copper 106, and CMP to have copper remain in the trench (Fig.1B). It would have been obvious to use the method of Amartur to remove the barrier layer as cited because Amartur teaches that the normalization and analysis technique is useful for such structures.

As to claims 19-20, see the rejection of claim 3-4.

Claims 8, 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amartur (US 6,664,557 B1) in view of Johnson et al (US 6,340,602 B1).

The discussion of Amartur from above is repeated here.

As to claim 8, Amartur does not disclose to take a diversity of spectra such than an entire surface is represented. Johnson teaches that it is useful to illuminate several zones with broad band light to represent an entire surface of the semiconductor wafer (see abstract, Fig.10). It would have obvious to one with ordinary skill in the art to illuminate several zones with broad band light to represent an entire surface of the semiconductor wafer as cited in the method of Amartur because Johnson teaches that this is a useful technique in optical analysis of wafers.

As to claim 11, it would have been obvious to one with ordinary skill in the art, that if several zones are analyzed, as taught to be useful by Johnson, that this would be done with multiple probes in the modified method of Amartur because multiple probes would save time compared to one probe to monitor a corresponding multiple number of areas of the substrate.

As to claim 12, since the wafer, polishing pad and table are all concentric, it would have been obvious to one with ordinary skill in the art that the zones are also concentric in order to efficiently monitor the complete surface.

As to claim 13, see the rejection of claim 8. Amartur discloses to monitor multiple reflectance spectra as cited.

As to claim 14, see the rejection of claim 6.

As to claim 15, the spectra changes from a linear to sinusoidal shape (when curve changes from 502 to 504 in Figure 5).

As to claim 16-17, see the rejection of claims 3-4.

Response to Arguments

Applicant's arguments filed 2/17/06 been fully considered but they are not persuasive.

Applicant argues that Amatur does not disclose tracking the location on the wafer where the optical beam hits. This is not persuasive since, as broadly cited, Amatur, tracks a location where monitoring is desired. The claims are not limited to tracking only one location, exclusive of other locations. Amatur tracks a concentric band, which correspondingly tracks locations on the wafer within that band.

Applicant argues that Amatur does not disclose adjusting a parameter. This is argument is not commensurate in scope with the claim language. As broadly interpreted, a parameter is adjusted by ending the process on the first area (the surface being polished) relative to another area (the surface not being polished).

As to claim 18, applicant argues that Amatur does not disclose ending the CMP process in one area relative to another area. In response, the claims are broadly interpreted, and they do not cite adjusting a parameter to a first area and not adjusting a parameter corresponding to a second area. As broadly cited, the modified method of Amatur reads on the claims since a parameter is adjusted (endpoint).

Paragraph [0047] discloses making intermediate adjustments, such as changing the pressure, amount of slurry or rotation speed. The pressure may be increased in zones that need a change in removal rate. However, the claims are not commensurate in scope with the discussion found in the specification.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Anita K Alanko
Primary Examiner
Art Unit 1765